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## Research Article

### Labor Transformation in the Agricultural Sector in Riau Province

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#### ABSTRACT

One of the efforts to increase economic added value is through economic structure transformation. The impact of the transformation of the economic structure is the transformation of workforce. Economic transformation that is not accompanied by labor transformation can result in lower incomes for workers in the agricultural sector and a scarcity of labor in the non-agricultural sectors. The goal of this research is to analyze the transformation of the workforce structure in Riau Province and to build a model that can explain the transformation of the workforce structure in Riau Province during 2018-2023. Using panel regression analysis, this research found that the GRDP ratio and average years of schooling had a linear positive effect on the transformation of labor structure. Thus, it can be said that these two variables can encourage workforce transformation in Riau Province. Regarding the various results obtained, there are several policy suggestions and recommendations that can be given to related parties.

**Keywords:** *Agricultural sector, Economic transformation, Education, Labor transformation, Wages*

#### Introduction

The process of economic development of a country is often interpreted as a process of structural transformation. This structural transformation process is in the form of a shift from the agricultural sector to the industrial sector and industry to the service sector. In this case, the process of economic development is characterized by changes in sectoral contributions to national output as a result of a shift in the national workforce from the agricultural sector to the industrial sector and then to the service sector (Arief, 1995).

Economic development has an important meaning in describing the condition of a country. Indicators of economic development success can be seen from the increase in Gross Domestic Product (GDP), reducing poverty, overcoming income inequality, and providing employment Dalal-Clayton and Bass (2002). Economic development encourages economic growth followed by changes in economic structure. According to Saunders, Warford, and Wellingius (1994), economic development is a process of transformation characterized by changes in economic structure, changes in the

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base of economic activity so that modernization is needed to carry out economic development and accelerate economic growth. One indicator of economic development in a country is changing the structure of the economy. According to Habermas and Habermas (1991), the transformation of the economic structure changes the economic structure from the agricultural sector to the industrial or service sectors, each of which undergoes different changes. The transformation of the economic structure is not only shown by the decreasing proportion of the primary sector which was replaced by the secondary and tertiary sectors in the formation of GDP but also focused on the use of production factors one of which is labor (Marelli & Signorelli, 2010).

The agricultural sector is a sector that plays a strategic role at the beginning of Indonesia's development. This sector supplies raw food sources and raw materials for the industrial sector and absorbs a large workforce. However, this sector has a weakness in the form of small added value compared to other sectors.

One way to increase economic added value in Indonesia is through economic structural transformation, by increasing the size of the Gross Domestic Product (GDP) of the non-agricultural sector so that the contribution of non-agricultural sector GDP is higher than the contribution of agricultural sector GDP. This causes the contribution of the agricultural sector's GDP to decrease from time to time even though the value continues to increase.

In addition to increasing GDP, another impact of the transformation of the economic structure is the transformation of the workforce, namely in the form of an increase in the contribution of the non-agricultural sector and a decrease in the contribution of the agricultural sector. In the future, workforce transformation will support the transformation of the economic structure in a sustainable manner (Dirgantoro, 2010).

The transformation of the workforce from the agricultural sector to industry and services is said to be successful if there is a balance between the contribution of the labor force in the agriculture, industry, and service sectors. In

other words, the labor contribution will approach the GDP contribution in each sector.

The difference between the contribution of GDP and the contribution of labor to the agricultural sector indicates that the agricultural sector is still labor-intensive so that the average income received will be smaller compared to the income from the non-agricultural sector. The production of the agricultural sector must be divided by a very large number of agricultural sector workers. In the long term, if this is left unchecked, it is feared that it will cause a process of impoverishment and exploitation of human resources. Meanwhile, the increase in GDP contribution from the industrial and service sectors that is not balanced by the contribution of labor will cause a shortage of labor in these sectors. As a result, the existing industrial and service sectors will experience a slowdown in their growth.

Riau Province, one of the provinces strategically located in the middle of the island of Sumatra, has great potential in the industrial and service sectors. This potential is reflected in the large contribution of the industrial and service sectors to the GRDP (Gross Regional Domestic Product). However, the transformation of the workforce from the agricultural sector to the industrial and service sectors has not shown success.

Based on figure 1(a), during the period 2018-2023, the agricultural sector is the sector that has the second largest contribution to GRDP among the industrial and service sectors in Riau Province. In 2023, the contribution of the agricultural sector to the GRDP of Riau Province was 26.30 percent, while the contribution of the industrial and service sectors to the GRDP of Riau Province was 27.55 percent and 16.58 percent, respectively.

Meanwhile, in terms of labor, the contribution of the agriculture, industry, and service sectors in Riau Province has a difference in position when compared to the contribution of GRDP. As shown in figure 1(b), the contribution of the service sector dominates the workforce in Riau Province with a contribution value of 45.82 percent in 2023, while the agriculture and service sector contributes to the workforce by 38.20 percent and 7.89 percent in 2023.

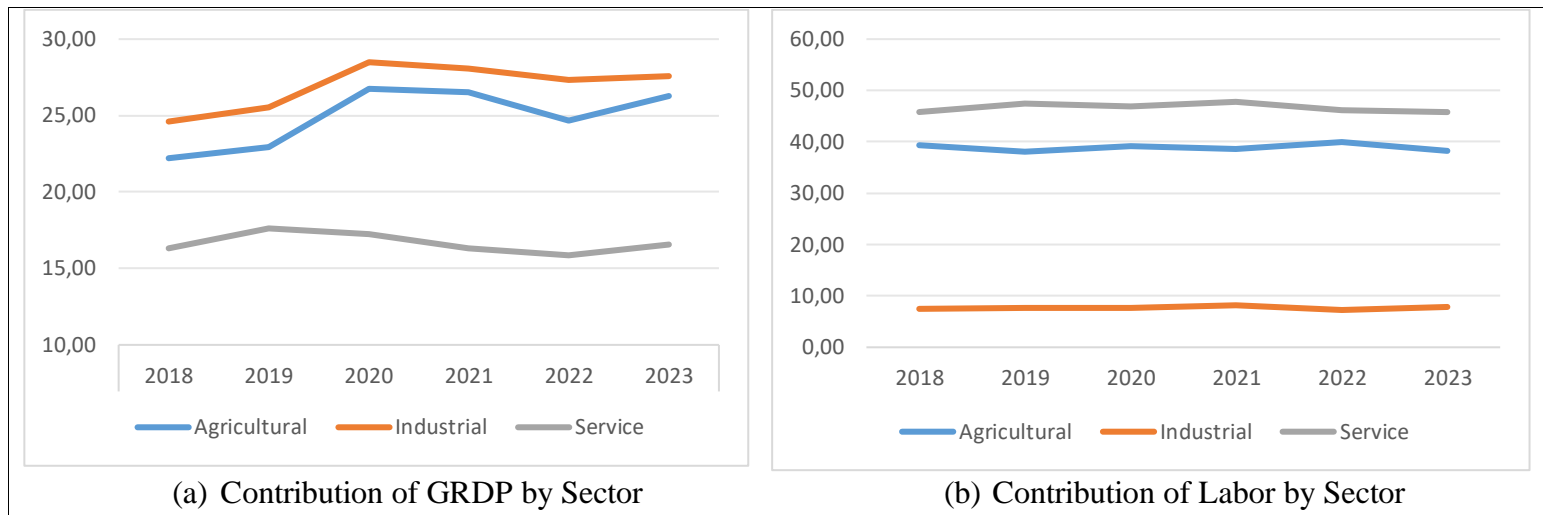


Figure 1. Contribution of GRDP and Labor by Sector in Riau Province, 2018-2023  
Source: Statistics of Indonesia

In general, based on figures 1(a) and 1(b), it shows that there is a considerable difference between the contribution of GRDP and the contribution of labor in each sector. This difference causes an imbalance in the labor market in each sector. It also shows that the transformation of the workforce from the agricultural sector to the industrial and service sectors has not been fully successful.

Referring to the description above, the objectives of this study can be formulated as follows: (1) analyze the transformation of the labor structure in Riau Province, and (2) form a model that can explain the transformation of the labor structure in Riau Province.

## Literature Review

### 1. Structural Transformation

Structural transformation is a process of shifting the size of the percentage of a sector or business field in the national economy. This process is marked by the shift of the agricultural sector to the industrial and service sectors (Yennetri, 1998). In the process of structural transformation, the transformation that can be seen is usually in the transformation of the GDP structure and the transformation of the labor structure.

### 2. Labor Structural Transformation

According to Utomo (2014), workforce transformation occurs due to the existence of

pulling factors and driving factors. The pulling factor comes from the industrial and service sectors because these sectors are growing stronger and require more labor. The driving factor comes from the agricultural sector which is increasingly less promising.

In detail, Dirgantoro (2010) mentioned several factors that caused the transformation of the workforce, including the increase in the level of education in the young population, changes in norms among job seekers and the community related to the type and situation of employment, increasing opportunities to work in the non-agricultural sector, and relatively low wages in the agricultural sector.

### 3. Structural Transformation of GDP

According to Sukirno (2006), the impact of the development process is a large shift in the percentage of Gross Domestic Product/Gross Regional Domestic Product (GDP/GDRP) of the sector. In the traditional economy, the sector that provides the largest percentage is the agricultural sector. Furthermore, through the process of industrialization, the role of the agricultural sector will decrease and the industrial and service sectors will increase. Although it has decreased in percentage, the agricultural sector has basically experienced an increase in value, it's just that the increase in value is not greater than that of the industrial and service sectors.

#### 4. Wages

Wages are remuneration imposed on labor. The wages in question are the rewards received by workers, employees, and freelancers in the form of money or goods paid by the company/office/employer during a certain period.

In the wages of the agricultural sector and the industrial sector, there is a considerable gap where the wages of the industrial sector tend to be larger than the wages of the agricultural sector. This happens because the company gives wages based on its profits. Meanwhile, the production profits of the agricultural sector are smaller than the production profits of the industrial and service sectors. Companies in the industrial and service sectors also set higher labor specifications than the agricultural sector. These specifications can be in the form of education and expertise. Citing from Lewis' theory, a higher wage level in the industrial and service sectors than in the agricultural sector will result in the shift of agricultural sector labor to the industrial and service sectors.

#### 5. Education

Education has an important role as a medium to improve the quality of human life. A person who has a higher level of education and a length of time in education will have a better job and wage than a lower education. Simanjuntak (1985) stated that the higher the education of an individual, the more open the opportunity to work. Therefore, residents with higher education levels will choose jobs that are suitable for high skills and incomes and generally work in the industrial and service sectors.

#### Methods

This study covers 12 regencies/municipalities in Riau Province with a research period of 2018-2023. The data used is secondary data which is obtained entirely from various publications released by BPS-Statistics Indonesia. In detail, the details of the variables used in this study are found in Table 1.

Table 1. Details of Variables Used

No. (1)	Variables (2)	Description (3)	Notation (4)	Unit (5)
1.	Transformation of the agricultural sector labor to the industrial sector	The number of workers working in the industrial sector divided by the number of workers working in the agricultural sector	TransLabor IndAgr	-
2.	Transformation of the agricultural sector labor to the service sector	The number of workers working in the service sector divided by the number of workers working in the agricultural sector	TransLabor ServAgr	-
3.	Ratio of industrial sector GRDP to agricultural sector	GRDP figures at current market prices of industrial sector divided by GRDP figures at current market prices of agricultural sector	RatioGRDP IndAgr	-
4.	Ratio of service sector GRDP to agricultural sector	GRDP figures at current market prices of service sector divided by GRDP figures at current market prices of agricultural sector	RatioGRDP ServAgr	-
5.	Ratio of industrial sector wages to agricultural sector Industrial	Industrial sector labor wages divided by agricultural sector labor wages	RatioWage IndAgr	-
6.	Ratio of service sector wages to agricultural sector	Service sector labor wages divided by agricultural sector labor wages	RatioWage ServAgr	-
7.	Average length of schooling	Average length of schooling for residents aged 25 years and above	RLS	Year

Furthermore, to answer the research objectives as described in the previous section, the analysis method used is panel regression analysis. There are two models that will be used in this study. The first model (model 1) is used to analyze the transformation of the industry-agriculture sector workforce. Mathematically, the first model can be written as follows.

$$\begin{aligned} \text{TRANSLabor IndAgr}_{it} &= \alpha + \beta_1 \text{RatioGDRP IndAgr}_{it} \\ &+ \beta_2 \text{Ratio Wage IndAgr}_{it} \\ &+ \beta_3 \text{RLS}_{it} + u_i + \varepsilon_{it} \end{aligned}$$

Meanwhile, the second model (model 2) is used to analyze the transformation of the service-agriculture sector workforce. Mathematically, the second model can be written as follows.

$$\begin{aligned} \text{TRANSLabor ServAgr}_{it} &= \alpha + \beta_1 \text{RatioGDRP ServAgr}_{it} \\ &+ \beta_2 \text{Ratio Wage ServAgr}_{it} \\ &+ \beta_3 \text{RLS}_{it} + u_i + \varepsilon_{it} \end{aligned}$$

Where  $\alpha$ ,  $u_i$ , dan  $\varepsilon$  each is an intercept, an individual effect and error component.

There are three types of panel regression models (Baltagi, 2005). The first type is the Common Effect Model (CEM). This model simply assumes that the effects between individuals are the same over various time periods. The second type is the Fixed Effect Model (FEM). This model takes into account the difference in intercept between individuals caused by the existence of a fixed individual effect and correlates with independent variables. The third type is the Random Effect Model (REM). In contrast to FEM, REM treats individual effects as part of an error component that is random and does not correlate with independent variables.

In panel regression analysis, there are several stages of analysis that need to be carried out to get the best panel regression model that can be analyzed in depth. The analysis stage begins by determining the best panel regression model among the possible models. The next stage is to examine the structure of the

residual variance-covariance matrix to determine the estimation method to be used. The next stage is to examine the existing classical assumptions. Once it has been confirmed that all classical assumptions are met, the final stage is to evaluate as well as interpret. Evaluation and interpretation can be carried out through two approaches, namely the economic approach by paying attention to the direction and signs of each coefficient, and the statistical approach by paying attention to the measures of goodness obtained from the results of the model estimation.

The selection of the panel regression model in this study was carried out formally through a series of hypothesis tests. The Chow test is used to select the best model between CEM and FEM. The Hausman test is used to select the best model between REM and FEM. The Breusch-Pagan Lagrange Multiplier test is used to select the best model between CEM and REM.

## Result and Discussion

In this section, the results of the research obtained by referring to the research objectives as described in the previous section.

Table 2 gives a descriptive statistic in the form of an average of each variable used in this study. Based on table 2, it can be seen that the highest labor transformation, both in the agriculture-industry sector and the agriculture-service sector, is Pekanbaru Municipality, which is 4.51 and 16.92 respectively during the 2018-2023 period. This means that if in Pekanbaru Municipality there are 100 workers in the agricultural sector, then in the region there are 451 workers in the industrial sector and 1,692 workers in the service sector. This is relatively reasonable and understandable considering that Pekanbaru Municipality is the capital of Riau Province with most of the workforce working in the industrial and service sectors.

On the other hand, Rokan Hilir Regency is the district with the lowest labor transformation, both from the agriculture-industry sector and the agriculture-service sector. On average during the 2018-2023 period, the labor transformation of 0.16 and 0.58 shows that if there are 100 workers in the agricultural sector, at the same time there are 16 workers in

the industrial sector and 58 workers in the service sector in Rokan Hilir Regency.

In general, the regencies/municipalities agricultural sector in Riau Province is currently still the largest contributor to labor absorption

compared to the industrial and service sectors. The transformation of the regency/municipality workforce in Riau Province is also fluctuating.

Table 2. Average of Research Variables in 2018-2023

Regency /Municipality	Trans Labor industrial-agriculture	Trans Labor Service-Agriculture	Ratio GRDP industrial-agriculture	Ratio GRDP service-agriculture	Ratio Wage industrial-agriculture	Rasio wage Service-agriculture	RLS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Kuantan Singingi	0.28	0.73	0.54	0.16	1.07	0.94	8.65
Indragiri Hulu	0.28	0.87	0.92	0.59	1.17	0.81	8.32
Indragiri Hilir	0.29	0.76	0.53	0.44	1.21	0.92	7.24
Pelalawan	0.21	0.57	1.20	0.15	1.42	0.73	8.60
Siak	0.43	0.82	1.74	0.24	1.15	0.85	9.76
Kampar	0.32	0.92	0.76	0.24	1.05	0.86	9.28
Rokan Hulu	0.18	0.56	0.47	0.21	1.13	0.97	8.51
Bengkalis	0.50	0.99	1.39	0.83	1.86	1.18	9.58
Rokan Hilir	0.16	0.58	0.57	0.18	1.43	0.90	8.28
Kepulauan Meranti	0.36	1.01	0.75	0.36	1.38	1.25	7.73
Pekanbaru	4.51	16.92	13.29	30.51	0.79	0.74	11.69
Dumai	1.64	4.24	11.15	4.05	0.93	0.78	10.04
<b>Riau Province</b>	<b>0.20</b>	<b>1.20</b>	<b>1.08</b>	<b>0.67</b>	<b>1.27</b>	<b>0.96</b>	<b>9.14</b>

Source: Statistics Indonesia, 2023 (data processing results)

Furthermore, based on table 2, the results were also obtained that the industrial sector in several regencies/municipalities in the province contributed a larger GRDP than the agricultural sector. These regencies/municipalities are Pelalawan Regency, Siak Regency, Bengkalis Regency, Pekanbaru Municipality and Dumai Municipality. Meanwhile, the regencies/municipalities whose GRDP in the service sector is larger than the agricultural sector are Pekanbaru Municipality and Dumai Municipality.

Furthermore, judging from the wage ratio variable, in general, it can be said that on average during the 2018-2023 period, industrial sector wages have a greater value than agricultural sector wages in almost all regencies/municipalities in Riau Province, except for Rokan Hilir Regency and Meranti Islands Regency. Meanwhile, in the service sector, only the Meranti Islands Regency and Bengkalis Regency have a wage value greater than the wage value

of the agricultural sector. Indirectly, these results show that the level of labor welfare in the regencies/municipalities agricultural sector in Riau Province is lower than that of the industrial sector, but higher than that of the service sector.

If you look at the Average Length of School (RLS) figures, on average during the period 2018-2023, Pekanbaru Municipality and Dumai Municipality have a higher average length of school than other regencies in Riau Province, which are 11.69 years and 10.04 years, respectively. On the other hand, Indragiri Hilir Regency has the lowest average length of schooling, which is 7.24 years during 2018-2023.

Related to the second research objective, table 3 is a summary of the results of the selection of the best research model. Based on table 3, it can be concluded that REM is the best panel regression model to be used in the next stage of analysis.

Table 3. Summary the results selection of the best panel regression model

Testing	Test Results ( <i>p-value</i> )		Conclusion ( $\alpha = 0,05$ )
	Model 1	Model 2	
(1)	(2)	(3)	(4)
Chow Test	0.0000	0.0000	FEM better than CEM
Hausman Test	0.0636	0.0873	REM better than FEM
BP LM Test	0.0000	0.0000	REM better than CEM

Source: Statistics Indonesia, 2023 (data processing results)

Based on the goodness measure of the model produced, as presented in table 4, it can be seen that all models used have met the assumption of error normality, where the p-value generated from the Jarque-Bera test is greater than significance level of 5 percent. In addition, by paying attention to the p-value generated from the simultaneous F test, it can also be concluded that the independent variable used simultaneously has a significant effect on the dependent variable at the significance level of 5 percent. The relatively high Adjusted R-Squared value indicates that the model estimation results obtained are meaningful enough that they can be used for the purpose of deeper interpretation and analysis.

By reviewing the results in model 1, as shown in table 4, it is known that every increase in the ratio of industrial GRDP to agriculture will increase the level of labor transformation in the industrial-agricultural sector by 0.1954. This result is in accordance with the economic theory of labor demand, namely if there is an increase in GRDP in a region, the labor force will be more absorbed. A similar condition is also obtained in model 2, where every increase in the ratio of GRDP of services to agriculture will increase the level of labor transformation in the service-agricultural sector by 0.2438.

Table 4. Estimation results of the research model

Variabel	Model 1	Model 2
(1)	(2)	(3)
Intercept	-1.8408*** (0.6306)	2.4699 (1.6375)
RatioGRDP IndAgr	0.1954*** (0.0175)	-
RatioGRDP ServAgr	-	0.2438*** (0.0135)
RatioWage IndAgr	-0.1955 (0.1270)	-
RatioWage ServAgr	-	0.9015** (0.3839)
RLS	0.2737*** (0.6306)	0.1167 (1.6375)
Summary of Test Results		
<i>R-Squared</i>	0.7933	0.9287
<i>Adj R-Squared</i>	0.7811	0.9246
<i>F test (p-value)</i>	65.2494 (0.0000)	221.5901 (0.0000)
<i>JB test (p-value)</i>	0.3467 (0.8408)	0.7476 (0.6881)

Source: Statistics Indonesia, 2023 (data processing results)

Information: \*\*\*, \*\*, and \* showed significant at the real level of 1, 5, and 10 percent, respectively. Numbers in parentheses are a default error (*standard error*).

Furthermore, in model 2, every one unit increase in the ratio of wages in the service sector to agriculture will increase the level of transformation of the service-agricultural sector workforce by 0.9095. This result is in line with Lewis's theory which states that higher service sector wage compared to agricultural sector causes labor to move from agricultural sector to service sector.

Interestingly, the opposite condition is obtained in model 1 where every one unit increase in the ratio of industrial to agricultural sector wage will actually decrease the labor transformation rate of industrial-agricultural sector by 0.1955. Although in this model the effect is not significant at 10 percent significance level, indirectly this result indicates that if the government wants to increase the minimum wage in the industrial sector with the aim of making the labor shift from the agricultural sector to the industrial sector, the agricultural sector labor will still be unable to enter the industrial sector because the sector has special criteria and specifications in the form of skills and ability to produce high productivity.

Education as human capital often brings positive impacts in the field of labor. The same happens to the transformation of labor structure. Every one-year increase of average years of schooling will increase the labor transformation rate of industry-agriculture sector and labor transformation rate of service-agriculture sector by 0.2737 and 0.1167 respectively. People with higher education tend to have more choices in choosing their jobs than people with lower education. In general, people with higher education will choose to work in non-agricultural sector. That is why education will increase labor transformation.

There is a concern that increasing education levels will lead to a loss of workers in the agricultural sector, especially young people with secondary to tertiary education who are reluctant to become agricultural laborers. This is despite the fact that with their qualifications, they can utilize the latest agricultural technology and can access information about developments in the agricultural world. These advantages, if implemented, will make the agricultural sector run more efficiently. On the other hand, higher education also participates

in new discoveries in the agricultural sector, such as the discovery of superior seeds, more productive planting techniques, and agricultural technology that can produce more efficient crop production.

Based on the model estimation results obtained, several policy recommendations can be formulated by the government in supporting labor transformation. First, develop agro-industry by utilizing the latest technology. This is closely related to the large number of agricultural workers but the percentage is decreasing, so the government needs to compensate by improving technology so that farmers' productivity increases. In addition, transforming traditional agriculture into modern agriculture or agro-industry will also increase the added value of the agricultural sector.

Second, it is related to education policy. It is proven that the average years of schooling has a positive effect on labor transformation. Therefore, the government needs to determine policies to facilitate people to be highly educated. Indeed, most highly educated people will prefer to work in the non-agricultural sector, but on the other hand, educated people are still needed to operate agricultural machinery. In this regard, the government can also make policies regarding the agricultural technology curriculum for vocational schools, as well as opening agricultural technology majors at the tertiary education level.

The transformation structure that occurs is the transition from low productivity to high productivity, which is from the agriculture sector to the service sector. The workers moving from agriculture sector to services sector as the productivity of the service sector is higher than agriculture.

It is recommended that there is a need to expand employment opportunities in the agricultural sector, especially the horticulture, livestock, fisheries and plantation sub-sectors, including by expanding farming land, mastering farming technology and investing both money from farmers' capital formation, as well as government and private assistance. Agro-industry development is important to accelerate the transformation from the agricultural sector to the non-agricultural sector, especially the industrial and service sectors.



## Conclusion

Based on the results and discussion, the following conclusions can be drawn. First, currently, the agricultural sector is the sector with the most labor absorption in regency/municipality in Riau Province compared to the industrial and service sectors. Nevertheless, the wage level of labor in the agricultural sector is lower than that in the industrial sector, but higher than that in the services sector. In general, the condition of labor transformation in regencies/cities in Riau Province fluctuates. Second, the ratio of GRDP and average years of schooling positively affect the transformation of labor structure. Thus, the two variables can encourage labor transformation in Riau Province.

Third, increasing production in the agricultural sector is still faced with the constraints of limited land tenure, the capital owned by farmers controlling farming businesses, and farming businesses that are still small, so that employment opportunities in the agricultural sector cannot develop properly. The application of farming technology such as intensive farming management can increase farming productivity to open up employment opportunities in the agricultural sector. Increasing public demand for agricultural commodity products will encourage the development of production, thereby opening up employment opportunities in the agricultural sector. Investment plays an important role in developing the agricultural sector so that it can create employment opportunities.

Furthermore, suggestions that can be given for further research are as follows. First, considering that each regency/municipality has distinctive and different economic characteristics, future studies can conduct special research at the regency/municipality level. This will certainly require a longer data series. Second, the next studies can add various other variables that are considered relevant, such as the size of agricultural land that can represent the driving factor of labor transformation and the number of industries that can represent the pull factor of labor transformation. Finally, future studies can use other analysis models, such as using simultaneous equation models to obtain more comprehensive results.

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